# 2019 WisDOT Structure Inspection - Superstructures

## *1.1 Untitled Slide*


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"In this session, you will learn:

To properly code Reinforced Concrete Deck Girder bridges.

To define specific condition states of painted surfaces.

To describe common truss elements and assessments.

To understand common rules of thumb to use in bridge bearing evaluations."

## *1.3 Untitled Slide*


*“During the 1920’s and 1930’s, many reinforced concrete deck girder bridges were built throughout the United States. As of 2018, 264 of these structures remain in the Wisconsin bridge inventory.*

*These structures consist of concrete girders both below The exterior members have the primary function as a girder and a secondary function as a bridge parapets.*

*Because of the dual functions these members serve, they can in theory be inspected under both Girder and Railing elements.*

*However, WisDOT policy is to code these members using Element 110 – Reinforced Concrete Open Girder.”*

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*“Another opportunity for improvement in the inspection program is better and more consistent coding of paint conditions on structures. “*

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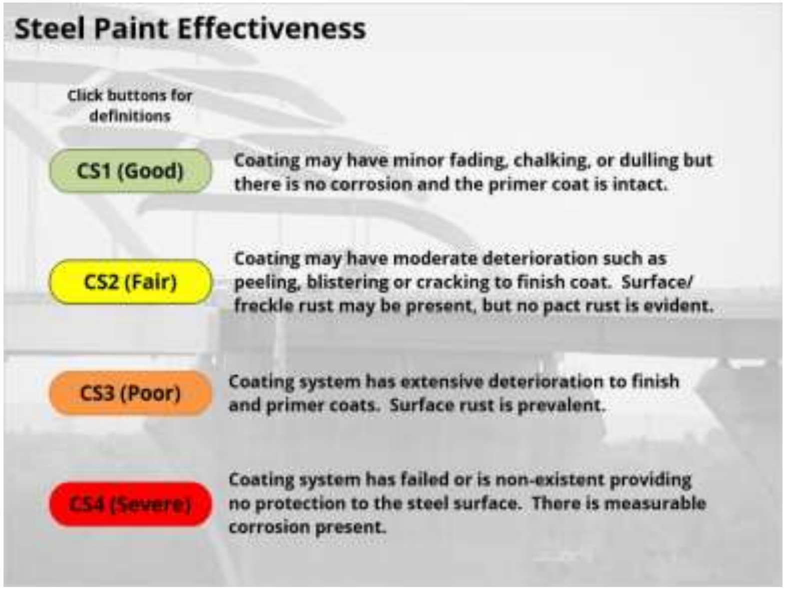


*"The effectiveness language used for the inspection of painted surfaces was updated in the 2018 field manual. Basically paint effectiveness can fall into one of four condition states.*

*Good condition, or CS1, defines paint that is fully effective.*

*Fair condition, or CS2, is considered substantially effective with only minor defects present.*

*Poor condition, or CS3, is considered limited effectiveness. The coatings system has extensive deterioration but is still providing some benefits.*

*Severe condition, or CS4, defines paint systems that have failed or are non-existent."*

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*Paint that is in good condition is depicted in this photo. Note that the paint shows no signs of fading nor peeling, and both the finish and primer coats are in excellent condition.*

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*In this example, the paint system is generally in good condition, but has spots where the finish coat is starting to peel away from the still fully-intact primer coat. These isolated areas would be coded in fair condition (CS2) while most of the paint system would still be in Good condition (or CS1).*

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*This is another example of the fair condition state (or CS2). As can be seen in the photo, most of the web of this girder has blush rust (or sometimes called freckle rust), but for the most part the paint system is performing its intended function.*

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*A common location for paint deterioration is on the bottom flange. This is due to several factors including the flat flange surface capturing salts, moisture and debris. In addition, on sharp corners such as the edge of flanges, there is potential for the paint to be thinner due to difficulties in application.*

*As can be seen in the photo, the web is mostly in condition state 2 due to minor deterioration of the finish coat. The flange is in condition state 3 due to extensive deterioration of the finish and primer coats and the moderate amount of areas of surface rust forming.*

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*This is another example of condition state 3 due to the prevalence of surface rust throughout the girder.*

*A general rule of thumb to determine when paint goes from CS2 to CS3 is as follows: If the inspector can wipe or scrape rust off the area with a hand or dull putty knife, then the paint is considered to be in at least CS3.*

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*This example shows a failed paint system, or condition state 4.*

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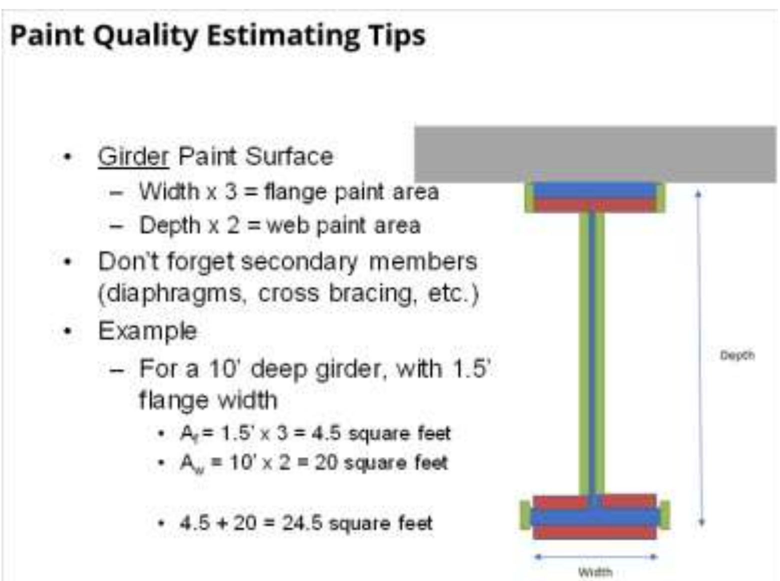


*Paint effectiveness quantities are measured in square feet.*

*A tip on how to quickly estimate the square footage of paint on a girder is as follows.*

*For the flanges, take the width of the bottom flange and multiply it by 3. The 3 represents the three distinct surfaces of the flange that are covered with paint. Note that the top side of the top flange is not included because it is buried in the concrete deck.*

*For the web paint, simply take the depth of the girder and multiply that by 2 to get the paint on both sides of the web*

*Add those numbers together and you have a rough square footage of a one foot section of the girder. Don't forget the secondary members as well; the paint area on those members can add up fast.*

*For example, a 10' deep girder with 1.5' wide flanges would have 4.5 square foot of paint area for the flanges and 20 square foot of paint area for the web, for a total of 24.5 square feet of paint surface per linear foot of girder.*

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*Another important tip to remember is that an element with measurable section loss where the defect is in condition state 3 or 4 for corrosion will still be in that same condition state after it has been repainted. Only the paint effectiveness element will be reverted back to a good condition state. The paint only covers up the section loss; it does not fix it.*

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Steel truss bridges were commonly built in the early to mid 1900's due to the ability for these structures to span long distances. As advances in technology allowed for steel girders and later prestressed girders allowed for longer and longer spans, the truss structure became mostly obsolete.

As of 2018, only 64 trusses remain in Wisconsin that carry highway traffic.

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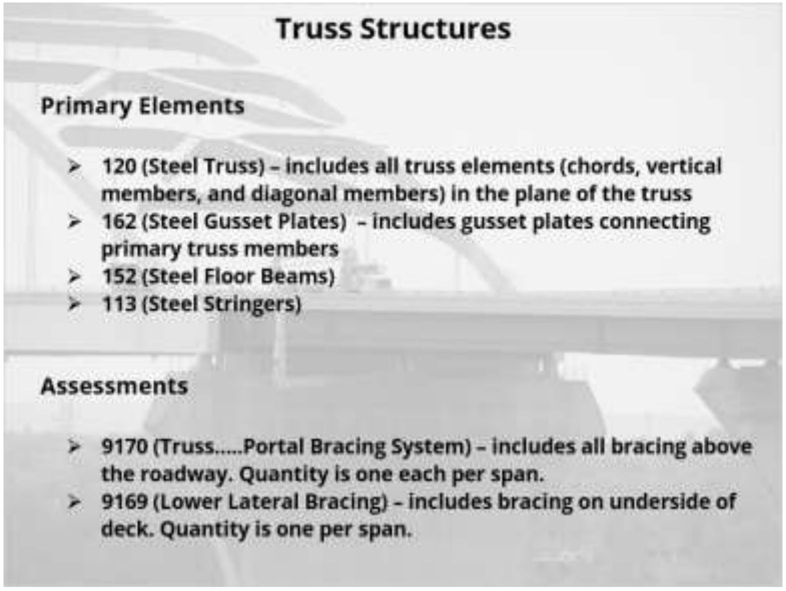


Inspection of truss superstructures are documented using four primary elements and two assessments to account for all the structural steel.

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Element 120 encompasses all tension and compression members in the plane of the truss as well as secondary gusset plates in the plane of the truss, and the condition is recorded in units of lineal feet.

In general, members should be inspected for corrosion and loss of cross-sectional area, which is the most common steel defect encountered with these structures. They should also be examined for cracking, pack rust, distortion, missing or loose fasteners and other common defects. A more detailed checklist for inspection of these members can be found in Part 2 Chapter 4 of the Wisconsin Structures Inspection Manual.

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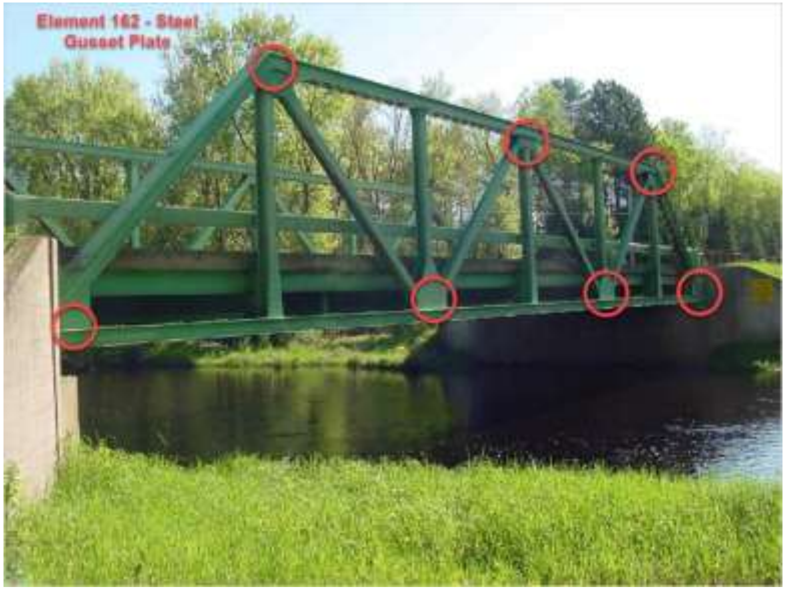


Gusset plates are typically used to connect truss members together, most commonly with bolts or rivets.  They are constructed of one or more steel plates and are documented in Each units on the inspection form.

Though all connection locations are thoroughly inspected, only gusset plates connecting primary truss members are recorded in Element 162.

For this bridge, the quantity for Element 162 would be 14, consisting of 7 primary gusset plate locations on each of the two trusses.

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Typically a panel point connection consists of two plates, one on the roadside of the truss and one on the exterior of the truss. This assembly is counted as a quantity of one on the inspection report.

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One other connection type consists of steel pins connecting eyebar members. For these situations, the gusset plate element is generally not valid. The inspector should code these using Element 161 for Steel Pins.

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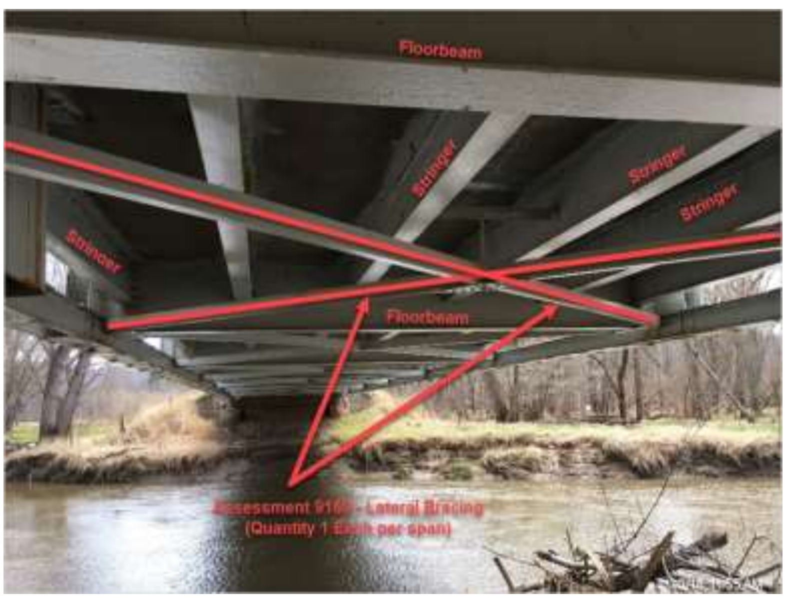


Below the truss deck, the primary superstructure components include: Element 152 Steel floor beams and Element 113 – Steel Stringers which are both recorded in lineal feet.

Also included is the Assessment for lower lateral bracing, where the quantity is recorded as 1 each per span.

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For overhead trusses that have bracing members above the roadway, use assessment 9170.

This assessment includes all portal, lateral and sway bracing above the roadway and the quantity is one Each per span.

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Expansion elastomeric bearings made of neoprene rubber and generally are thick rectangular pads that accommodate longitudinal and rotational superstructure movements.

More tips can be found in Part 2 – Chapter 4 of the Wisconsin Structures Inspection Manual.

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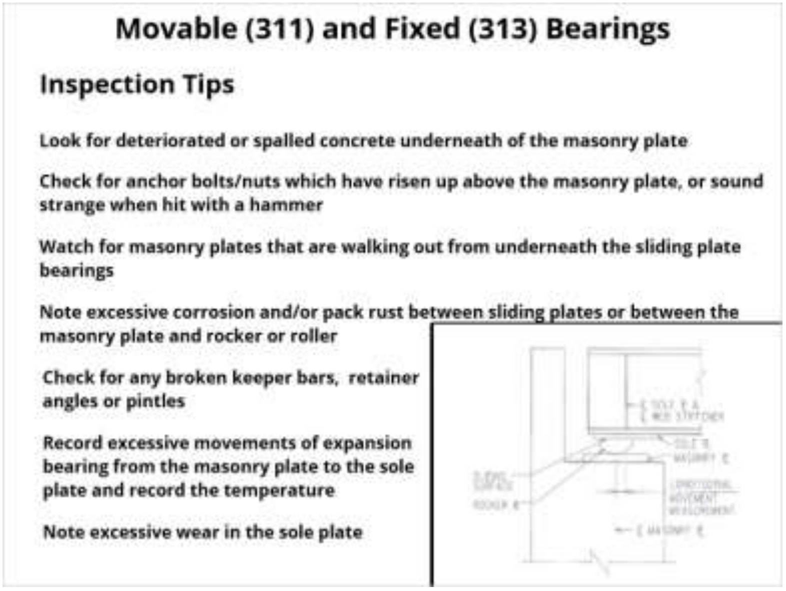


There are several types of movable steel bearings that are used to support bridge superstructures. These include rollers, rockers, and sliding plates. Movable bearings are designed to accommodate superstructure expansion, contraction, and rotation.

Corrosion is often a problem with movable bearings because they are always used at expansion joints. When these joints leak, water, deicing chemicals, and road debris are allowed to fall directly onto the bearing assemblies.

Check for wear and/or pitting on rubbing surfaces such as the underside of the sole plate, the bottom of the rocker, etc.

More tips can be found in Part 2 – Chapter 4 of the Wisconsin Structures Inspection Manual.

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Inspectors should be aware there are configurations where the girder rests on a single steel plate or elastomeric pad. These are not to be considered bearings and any defects shall be noted with the girder element.

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